

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
17 April 2008 (17.04.2008)

PCT

(10) International Publication Number  
WO 2008/045944 A2

(51) International Patent Classification:  
B65D 3/00 (2006.01)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:  
PCT/US2007/080955

(22) International Filing Date: 10 October 2007 (10.10.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/548,858 12 October 2006 (12.10.2006) US

(71) Applicant (for all designated States except US): HUHTAMAKI CONSUMER PACKAGING, INC. [US/US]; 9201 Packaging Drive, DeSoto, KS 66018 (US).

(72) Inventors; and

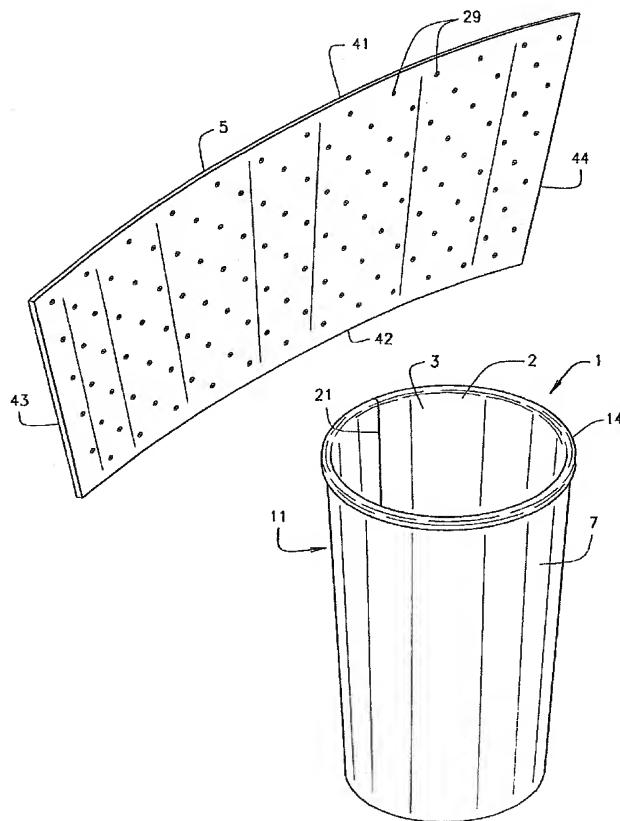
(75) Inventors/Applicants (for US only): ROBERTSON, Ronald, D. [US/US]; 1215 NE 93rd Street, Kansas City, MO 64155 (US). MAC EWEN, George, E. [US/US]; 3811 NW 62nd Terrace, Kansas City, MO 64151 (US).

(74) Agent: KIRCHER, William, B.; Blackwell Sanders LLP, 4801 Main St. Suite 1000, Kansas City, MO 64112 (US).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: MULTI WALLED CONTAINER AND METHOD



(57) Abstract: A container and method of manufacture are provided. The container includes a cup with a permanently attached sleeve overlying an exterior portion of the cup sidewall. The sleeve includes a plurality of inwardly directed protuberances providing a gap between a substantial portion of the cup sidewall and the sleeve.

WO 2008/045944 A2



**Published:**

- *without international search report and to be republished upon receipt of that report*

5

**MULTI WALLED CONTAINER AND METHOD****TECHNICAL FIELD**

The present invention relates to containers used for holding ingestibles for consumption, including drinks and foods and in particular those foods that are served hot, although, it is usable with cold ingestibles as well. An ingestible can be a food product or a drink particularly those products with a high amount of free liquid, e.g., soups, coffee, tea and the like. Such containers are well known in the industry.

**BACKGROUND ART**

An example of such a container in the form of a cup may be found in U.S. Patent 5,425,497. This patent discloses a formed cup having a frustoconical sidewall, a rolled upper lip and a bottom wall secured to the sidewall. A cup holder can be used to encircle a portion of the cup sidewall and includes a member that is assembled at the place of use by having opposite end portions of the cup holder provided with opposing slits to help accomplish assembly of the cup holder. The cup holder is designed to be separable from the cup and capable of being carried in a pocket, purse or brief case until need for use. The cup sidewall is then inserted into a formed cup holder. This required both close dimensioning of the sidewall and of the wrap to ensure that the wrap is properly positioned on the cup. The texture of the cup holder has nubbins and depressions creating air gaps between the user's hand and the cup. The wrap, necessarily has projecting free end portions. Other structures are known in the art, examples of which may be found in U.S. Patent 2,979,301 which also discloses the use of a cup holder in combination with a cup; U.S. Patent 2,028,566 which shows a corrugated cup holder; U.S. Patent 3,157,355 which showed a plastic cup having a plurality of formed conical protrusions 33 projecting outwardly from the sidewall of the cup which is complicated and difficult to form on a paper cup; U.S. Patent 3,123,276 which shows inner and outer cup portions held in place apparently by

5 interengaging ledges when the cups are stacked or nested together; a simple structure is shown in U.S. Patent 3,049,277 having an outer wrap overlying a portion of the cup sidewall; and a complicated structure is shown in U.S. Patent 2,591,578.

The containers of the prior art tend to be either complex in construction, or expensive, or require manual labor at locations where manual labor is at a premium or may result in faulty 10 containers which could lead to liability in the event assembly has not been properly achieved.

Another problem is to obtain sufficient insulation particularly when a hot liquid is to be served in the container, in an inexpensive manner while still providing sufficient resistance to bending and grip capability for the user to properly handle the filled container.

Thus, there is a need for an improved container for ingestibles.

## 15 DISCLOSURE OF INVENTION

A multi walled container is provided for the storing of ingestibles such as hot coffee and the like. The container includes a cup sidewall having opposite end portions. One end portion defines an open mouth and the other end portion is closed with a bottom wall member to form the cup and define a storage compartment. A sleeve member is positioned outwardly of and 20 overlying a portion of the sidewall and is secured thereto. The sleeve member includes a plurality of spaced apart protuberances which extend inwardly from an inside surface of the sleeve member forming a gap between portions of the exterior of the cup sidewall and the interior surface of the sleeve. At least some of the protuberances have a through opening adjacent an apex of the respective protuberance.

25 The present invention also involves a method of making a multi walled container. The method includes forming a cup with a sidewall having an exterior surface and a bottom wall connected to the sidewall. The cup has an open mouth defined by a portion of the sidewall. A sleeve member is formed having an interior surface conforming generally in shape to a substantial portion of the exterior surface of the cup sidewall. The sleeve member has a plurality

5 of spaced apart protuberances projecting inwardly from the interior surface of the sleeve member. The method further includes securing the sleeve member to the sidewall to prevent longitudinal movement between the sidewall and sleeve member after securement is effected. The above structure likewise has a physical appearance that conveys or suggests to the user that the cup is insulated. Additionally, the outside sleeve member, while dimpled may attractively contain

10 printing, logos or other indicia thereon.

#### BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is an exploded view of a container having a cup portion and sleeve member portion with the sleeve member portion being shown unattached and in a flat configuration.

Fig. 2 is a perspective elevation view of the container of Fig. 1.

15 Fig. 3 is a cross sectional view taken along the line 2-2 of the container of Fig. 2.

Fig. 4 is an enlarged view of the portion of the container in the balloon 4 of Fig. 3.

Like numbers throughout the various Figures designate like or similar parts and/or structure.

#### BEST MODE FOR CARRYING OUT THE INVENTION

20 The reference numeral 1 designates generally a container shown in the form of a sleeved cup having an upwardly opening mouth 2 providing communication to a chamber 3 adapted for storing ingestibles which can include drinks and/or food and in particular ingestibles with a high water content. The container 1 includes a sleeve 5 secured to in surrounding relationship to a portion of the sidewall 7 of the cup. The sleeve 5 is secured to the sidewall 7 to prevent relative movement in a longitudinal direction therebetween.

25

The container 1 includes a cup body designated generally 11 that includes the sidewall 7, and a bottom wall 12. The sidewall 7 has opposite end positions 9, 10 with the end position 9 defining the open mouth 2 adjacent a lip 14 which can be formed by rolling a portion of the sidewall 7. In a preferred embodiment, the sidewall 7 is made of paperboard and preferably

5       coated paperboard to resist the migration of liquids contained in the storage chamber 3 into the sidewall 7. Lips 14 are well known in the art and is best seen in Fig. 3. The lip 14 provides ease of use as well as resistance to bending of the upper portion of the sidewall 7 during use and may further form an area to engage or lock a lid (not shown) thereto. Opposite the end portion 9, is the lower end portion 10 of the sidewall 7 that is closed with the bottom member 12. The bottom 10 member 12 as shown, includes a bottom panel 16 having a depending skirt 15 which is secured to the sidewall 7 by a reverse bend 18 portion of the sidewall 7. Securement can be achieved by adhesive, sonic welding, sealants, or the like. A bead of sealant may also be provided at the junction between the panel 16 and sidewall 7 as at 19. Construction of the cup portion 11 of the container 1 as just described is well known in the art. Generally, the sidewall 7 is frustoconical 15 and has a generally circular transverse cross sectional shape of varying diameter depending upon where the cross section is taken between the open mouth 2 and the bottom end 10 of the sidewall 7. The taper of the sidewall 7 permits nesting for storage and shipping. The sidewall 7 is preferably formed from a blank, e.g., by wrapping about a mandrel and is provided with an overlapping seam 21 extending generally longitudinally at least between the mouth 2 and end 10. 20       The seam 21 can be formed by overlapping edge margin portions of the blank from which a sidewall 7 is made and adhering the overlapping margin portions together as by adhesive, sonic welding or the like. The exposed edges of the sidewall 7 at the seam 21 can be sealed to prevent the migration of liquids into the material comprising the sidewall 7. The thickness of the material of the sidewall 7 can be on the order of 0.01 to about 0.03 inches. The container of the 25 present invention can have a chamber 3 volume on the order of, for example, about 4 fluid ounces to about 16 fluid ounces although, larger or smaller containers can be made.

      A sleeve 5 surrounds and overlies a substantial portion of the sidewall 7 and has an interior surface portion 25 (Fig. 3) spaced from the exterior surface 24 of the sidewall 7. The surface 24 is preferably smooth and uninterrupted except at the seam 21 at least adjacent the

5 surface 25. As shown, the sleeve 5 has an interior surface 25 that is sized and shaped substantially, but slightly larger circumferentially, to the size and shape of the exterior surface 24 with an air gap 27 being provided between the interior sleeve surface 25 and the exterior sidewall surface 24. The standoff between the interior surface 25 and exterior surface 24 can be accomplished by the use of inwardly projecting protuberances 29 that can be easily formed into

10 the sleeve 5 when in blank form by, e.g., rolling with an embossing roller or pressing with a generally planar embossing die plate having a plurality of projecting forming pins on a forming surface. The protuberances 29 have a height H from the surface 24 on the order of 0.01 to about 0.06 inches. The protuberances 29 may be formed at any suitable time during the manufacturing process and can be formed prior to die cutting or otherwise forming of the sleeve blank or after

15 formation of the blank for the sleeve. The blank for forming the sleeve 5 may also be processed to form the protuberances 29 during the cup forming process for example, during a machine dwell period while the blank is waiting to be formed about the sidewall 7. The protuberances 29 have a hollow dimple or cavity 32 impressed into the outside surface 33 of the sleeve 5. As shown, the dimples 32 are generally round as best seen in Fig. 1 and would have a transverse

20 dimension, for example, a diameter on the order of about 0.06 to about 0.18 inches at the outside surface.

The protuberances 29 are preferably in the shape of a portion of a sphere. The depth D of a dimple 32 is approximately equal to the height H as described above. The protuberances 29 and hence the dimples 32 may be positioned in any desired pattern and spacing. Preferably, the

25 center to center spacing of the protuberances, based on the immediately adjacent protuberances is at least about 1/4 of an inch to approximately 3/4 inches. The protuberances 29 may be arranged in random patterns or regular patterns. Additionally, the sleeve 5 may be provided with dimples 32 and hence protuberances 29 in patterns for example, geometric patterns, letters, symbols or other devices for advertising and/or informational purposes. The exterior surface 33 of the sleeve

5    5 may also be provided with printed indicia 34 for informational and/or advertising purposes and  
may also be provided with color or colors as desired. The surface 33 is generally smooth and  
continuous without substantial projections to provide for easy and sure gripping of the container  
1 at any position therearound. The printed indicia 34 is preferably applied prior to forming the  
protuberances 29. It should be noted that the dimple size(s) and whatever pattern that has been  
10    selected for the dimples, convey a message to the user that the cup is insulated without  
interfering or obscuring the printed message or logos thereon.

The sleeve 5 may be assembled prior to securing to the sidewall 7 or may be wrapped  
about a formed sidewall 7 and formed in place about the sidewall 7. As best seen in Fig. 2, the  
sleeve 5 can be provided with a longitudinally extending seam 40 formed by overlapping side  
15    edge margin portions of the blank from which the sleeve 5 is formed. Such overlapping seams  
are well known in the art. As shown, the seams 40, 21 are circumferentially spaced apart and  
preferably are positioned on opposite sides of the container 1 and hence sidewall 7. The abutting  
surface portions of the overlapping edge margin portions can be secured together as for example  
by adhesive, heat sealing, ultra sonic welding or the like depending upon the type of material  
20    from which the sleeve 5 is made. Preferably, the sleeve 5 is made from a paperboard material  
and may be coated for either esthetic purposes and/or providing resistance to migration of liquids  
thereinto. The sleeve 5 may also be absorbent to absorb spills or dribbles. As seen in Fig. 1, if  
the sidewall 7 of the container 1 is frustoconical, the top and bottom edges 41, 42 respectively  
25    would preferably be curved and the side edges 43, 44 would preferably be tapered inwardly from  
the edge 41 to the edge 42.

As best seen in Figs. 1 and 3, the protuberances 29 are formed each with a through hole  
35 positioned adjacent the apex of the respective protuberance. The holes 35 are formed during  
the formation of the protuberances 29 through the use of a forming die having a plurality of  
pointed members projecting from the forming surface to pierce the material of the sleeve 5. The

5 blank for the sleeve 5 is then punched through so the small needle like spikes used in the forming die puncture through the sleeve material displacing the paper to the backside of the sleeve where it forms a crater like feature with projecting frayed or rough fibrous rim or collar 35C projecting for engagement with the exterior surface 24 of sidewall 7. The rim 35C is best seen in the enlarged view seen in Fig. 4. A rim 35C may partially or completely surround a respective hole

10 35. The collar 35C provides more height H and is formed from paper fibers when the sleeve 5 is made from fibrous paper material. Not all the holes 35 may have a rim 35C. Material is not removed from the sleeve blank, but rather is the material deformed or upset outwardly of the surface 25. The protuberances 29 and holes 35 can be created when the blank for the sleeve 5 is die cut or within the overwrapping machine. Some of the holes 35 may close after removal of

15 the forming tool.

In a preferred embodiment, the sleeve 5 is adhesively secured to the sidewall 7. As best seen in Fig. 2, adhesive spots 47, 48 may be applied to the surface 24 prior to mounting the sleeve 5 to the sidewall 7. The adhesive may also be applied to the sleeve 5 or to both the sleeve 5 and sidewall 7 prior to joinder. In a further preferred embodiment, the adhesive spots 47, 48 are each applied at the seams 40, 21 respectively. Other adhesive locations may be provided if desired. The upper edges of the adhesive spots 47, 48 are preferably positioned adjacent the upper edge 41 of the sleeve 5 for example, within about 1/4 inches to 3/ 4 of an inch from the edge 41. Preferably the width of the adhesive spots 47, 48 is sufficient to bridge the width of the seams 40, 21 respectively. It is also contemplated that the seams 21 and 40 could likewise be secured by heat welding a polymeric coating, e.g., polyethylene, on the paperboard and the seam 40 could be a butt seam heat welded to the exterior surface 7.

A lid, not shown, may be provided at the place of filling of the container 1. Such lids are well known in the art and may be provided with pre-formed access openings. Such a lid may also be provided with a skirt with an internally projecting rib to lock over the lip 14. As shipped

5 from the manufacturing facility, the container 1, except for the lid, is a complete container with the sleeve 5 secured to the sidewall 7 eliminating the need for subsequent container forming steps at the location of use. The tapered configuration of the sidewall 7 and the sleeve 5 permits nesting of the containers one within another, for efficiency of use of storage space. Preferably, the sleeve 5 has a height H1 that is at least half the height H2 from the bottom of the sidewall 7 to  
10 the bottom of the lip 14 as best seen in Fig. 3. Preferably the height H1 is at least about 70% and preferably at least about 80% of the height H2. In use, the dimples 32 enhance the gripability, insulation and esthetics of the container 1.

Thus, there has been shown and described several embodiments of a novel invention. As is evident from the foregoing description, certain aspects of the present invention are not limited  
15 by the particular details of the examples illustrated herein, and it is therefore contemplated that other modifications and applications, or equivalents thereof, will occur to those skilled in the art. The terms "having" and "including" and similar terms as used in the foregoing specification are used in the sense of "optional" or "may include" and not as "required". Many changes, modifications, variations and other uses and applications of the present construction will,  
20 however, become apparent to those skilled in the art after considering the specification and the accompanying drawings. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

## CLAIMS

We claim:

1. A multi walled container for storing ingestibles the container comprising:
  - a sidewall having opposite first and second opposite end portions, said first end portion defining an open mouth, said sidewall having an exterior surface;
  - a bottom wall adjacent the second end portion and closing the second end portion, said sidewall and bottom wall defining a storage chamber;
  - a sleeve member positioned outwardly of and overlying at least a portion of the sidewall and secured thereto, said sleeve member including a plurality of spaced apart protuberances extending inwardly from an inside surface of the sleeve member forming a gap between portions of the exterior and interior surfaces, at least some of said protuberances having a through opening adjacent an apex of the respective protuberance.
2. The container of claim 1 wherein the sidewall and sleeve member being made of paperboard.
3. The container of claim 2 wherein the sidewall and sleeve member each having a side seam formed from respective overlapping side edge margin portions.
4. The container of claim 3 wherein the side seam of the sleeve member being circumferentially spaced from the side seam of the sidewall.
5. The container of claim 4 wherein the side seams being positioned generally on opposite sides of the container.
6. The container of claim 4 wherein the sleeve member is secured to the sidewall at a location adjacent each side seam.
7. The container of claim 6 wherein the side seams being positioned generally on opposite sides of the container.
8. The container of claim 6 wherein the sleeve member being secured to the sidewall with at least two separate zones of adhesive.
9. The container of claim 8 wherein the sleeve member having opposite top and bottom edges, said top edge being adjacent the first end portion and the bottom edge being adjacent the second end portion, said at least two zones of adhesive being positioned between the exterior surface and the inside surface adjacent the top edge.
10. The container of claim 9 wherein the at least two zones of adhesive including a first zone and a second zone positioned on opposite sides of the container.

11. The container of claim 2 including a rim of fibrous material projecting from at least some of the protuberances toward the sidewall and circumscribing at least a portion of a respective said through opening.

12. A method of making a multi-walled container, said method including;

forming a cup with a paperboard sidewall with an exterior surface, a bottom wall connected to the sidewall and an open mouth;

forming a paperboard sleeve member with an interior surface conforming generally to a substantial portion of the exterior surface, said sleeve member having a plurality of spaced apart protuberances projecting inwardly from the interior surface at least some of said protuberances having a through opening adjacent an apex of the respective protuberance; and

securing the sleeve member to the sidewall.

13. The method of claim 12 wherein the sleeve being formed from a first blank wrapped about the sidewall and joining edge margin portions of the first blank together after wrapping to form a first side seam.

14. The method of claim 13 wherein the sidewall is formed from a second blank and joining edge margin portions of the second blank together after wrapping to form a second side seam.

15. The method of claim 12 including forming a rim of fibrous material adjacent at least some of the openings adjacent a respective said apex.

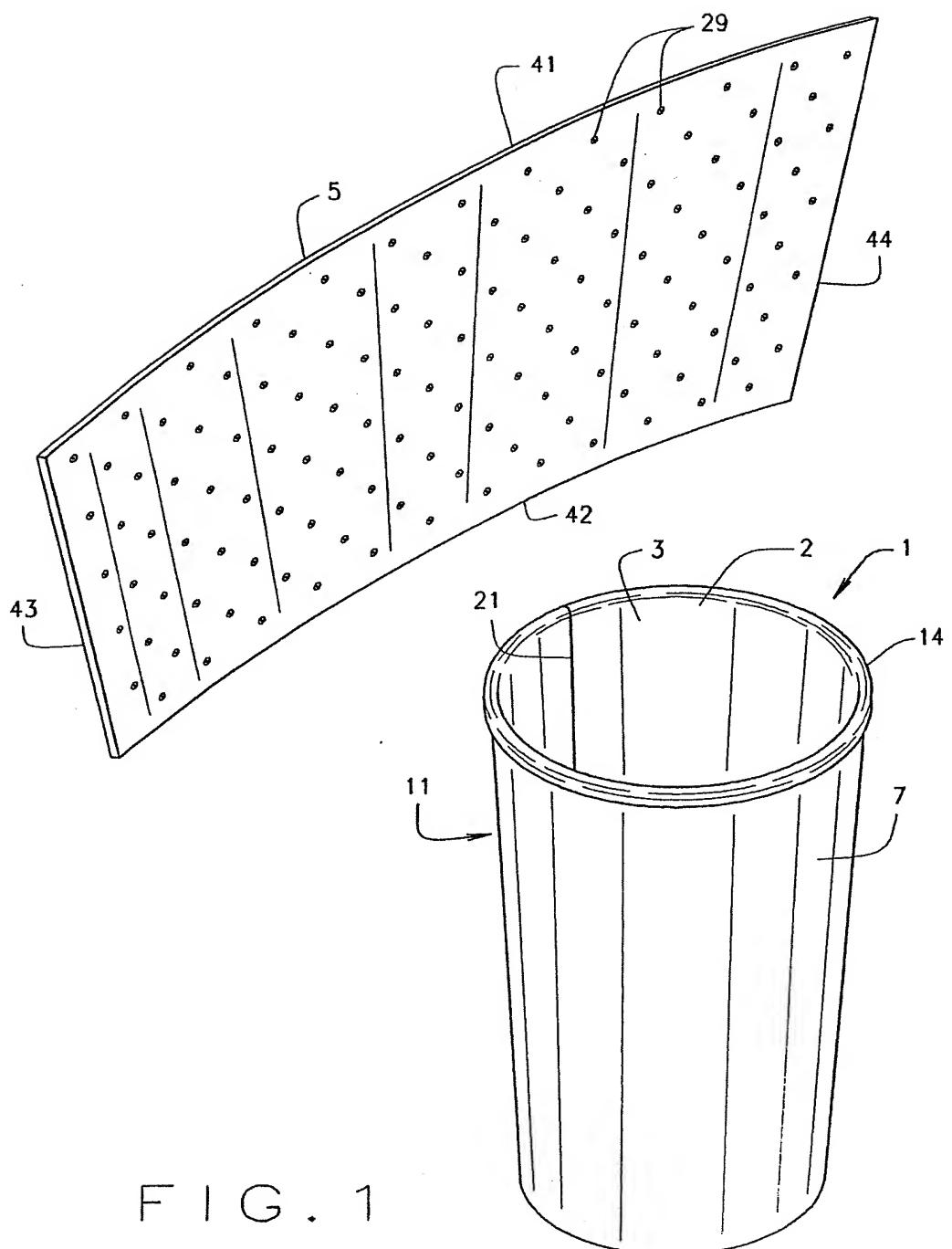


FIG. 1

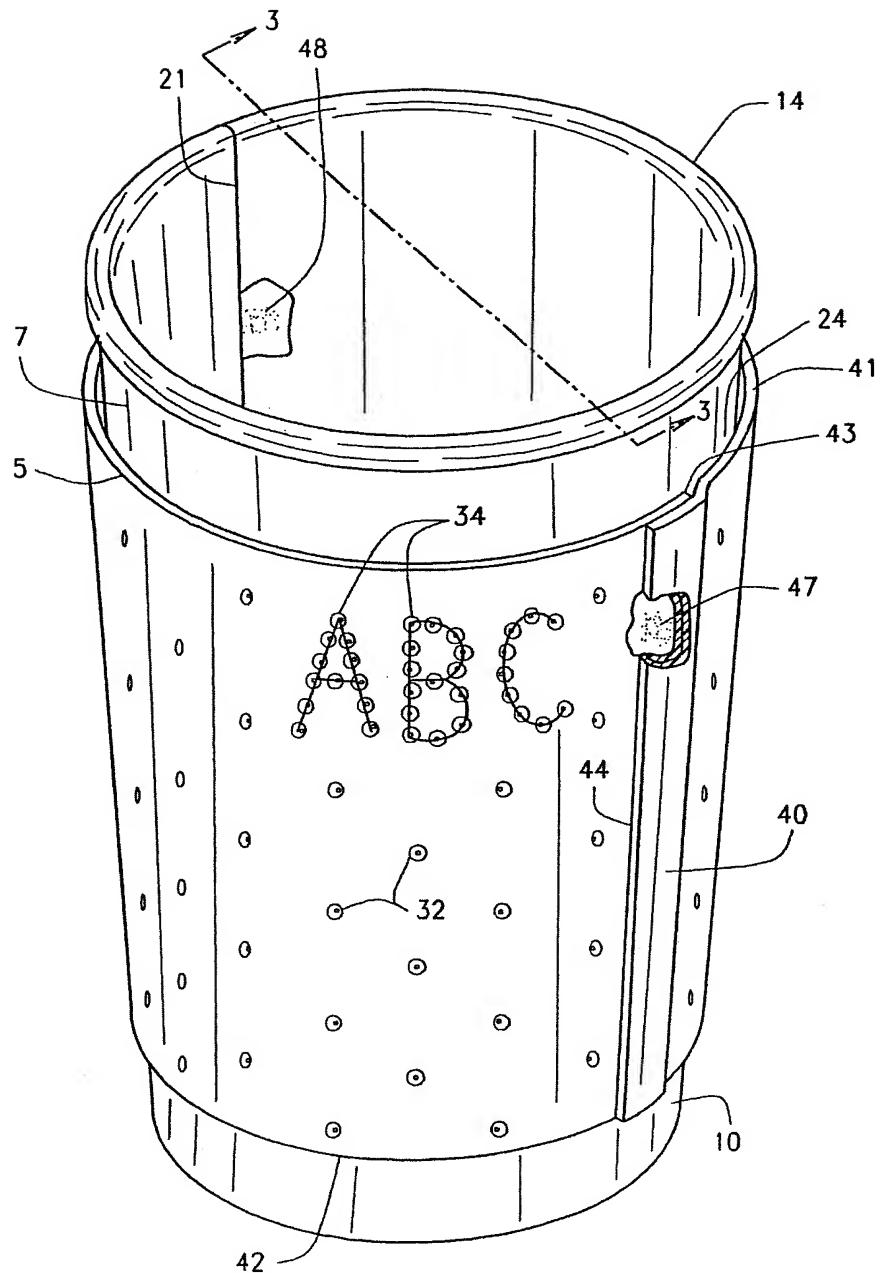


FIG. 2

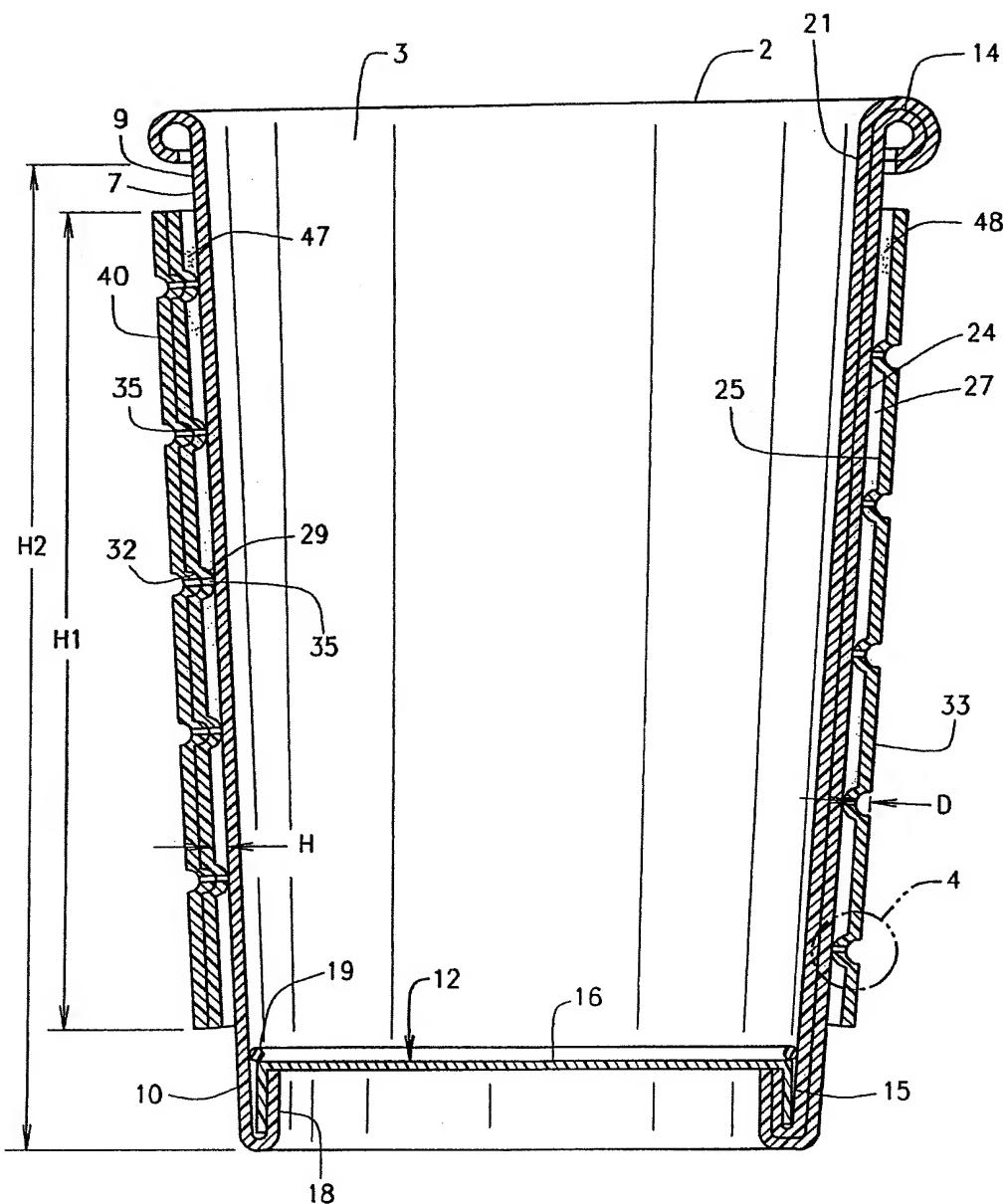


FIG. 3

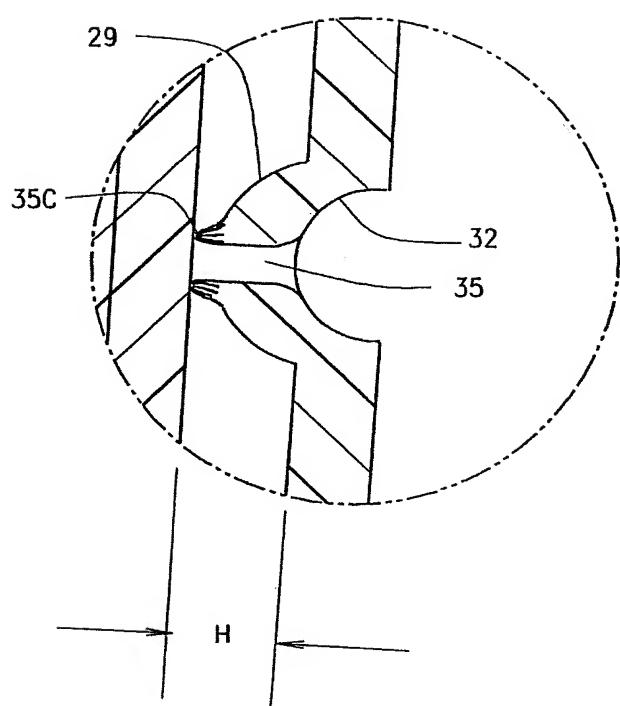


FIG. 4

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
17 April 2008 (17.04.2008)

PCT

(10) International Publication Number  
WO 2008/045944 A3(51) International Patent Classification:  
B65D 3/22 (2006.01)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SI, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:  
PCT/US2007/080955

(22) International Filing Date: 10 October 2007 (10.10.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/548,858 12 October 2006 (12.10.2006) US(71) Applicant (for all designated States except US): **HUH-TAMAKI CONSUMER PACKAGING, INC. [US/US];**  
9201 Packaging Drive, DeSoto, KS 66018 (US).

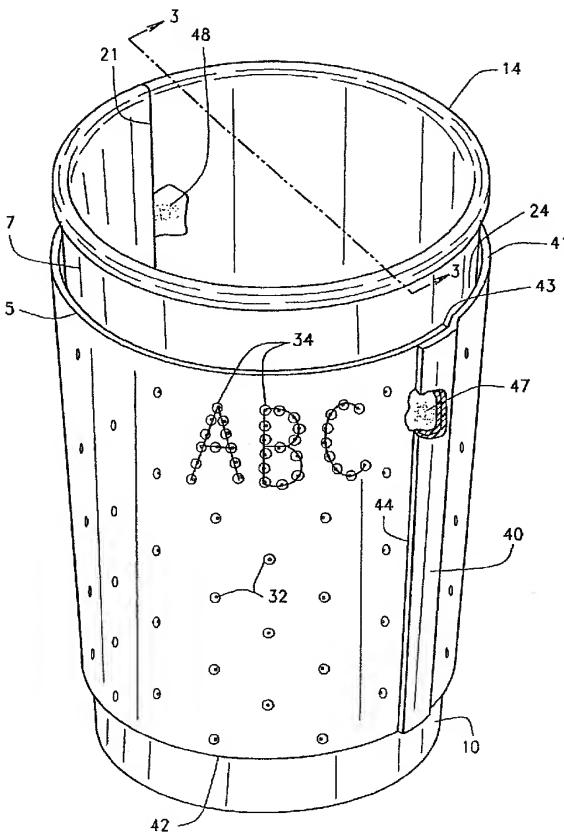
(72) Inventors; and

(75) Inventors/Applicants (for US only): **ROBERTSON, Ronald, D. [US/US];** 1215 NE 93rd Street, Kansas City, MO 64155 (US). **MAC EWEN, George, E. [US/US];** 3811 NW 62nd Terrace, Kansas City, MO 64151 (US).(74) Agent: **KIRCHER, William, B.;** Blackwell Sanders LLP, 4801 Main St. Suite 1000, Kansas City, MO 64112 (US).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*[Continued on next page]*

(54) Title: MULTI WALLED CONTAINER AND METHOD



(57) Abstract: A container and method of manufacture are provided. The container includes a cup with a permanently attached sleeve overlying an exterior portion of the cup sidewall. The sleeve includes a plurality of inwardly directed protuberances providing a gap between a substantial portion of the cup sidewall and the sleeve.



**Published:**

— *with international search report*

**(88) Date of publication of the international search report:**

21 August 2008

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/80955

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC: B65D 3/22( 2006.01)

USPC: 229/4.5,400,403

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 229/4.5,400,403

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,669,553 A (SMITH) 23 September 1997 (23.09.1997), see entire document.	1
X	US 5,203,490 A (ROE) 20 April 1993 (20.04.1993), see entire document.	1,2 12, 15
T, P	US 7,281,650 B1 (MILAN) 16 October 2007 (16.10.2007), see entire document.	1, 2, 12, 15
X	US 6,286,754 B1 (STIER ET AL) 11 September 2001 (11.09.2001), see entire document.	1, 2, 12, 13
---		-----
Y		14
Y	US 4,836,400 A (CHAFFEY ET AL) 06 June 1989 (06.06.1989), col. 4, lines 14-18, figs. 1 and 2.	3
Y	US 1,756,243 A (BENSON) 29 April 1930 (29.04.1930), lines 54-58 and 69-71, figs. 2 and 3.	4-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search  
19 May 2008 (19.05.2008)

Date of mailing of the international search report

27 MAY 2008

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (571) 273-3201

Authorized Officer

Gary E. Elkins

Telephone No. (571)272-3750

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/US07/80955

**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3908523 A (SHIKAYA) 30 September 1975 (30.09.1975), col. 2, lines 32-35.	8-10
Y	US 5,226,585 A (VARANO) 13 July 1993 (13.07.1993), see entire document.	14